PATENT SPECIFICATION (11) 1 546 433

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(21) Application No. 45137/76 (22) Filed 29 Oct. 1976 (19)

(31) Convention Application No's 7533593 (32) Filed 3 Nov. 1975
7621469 13 Jul. 1976 in

(33) France (FR)

(44) Complete Specification Published 23 May 1979

(51) INT. CL.² B65 D 33/24

(52) Index at Acceptance
B8K 2G2 2K1 2M BA
B5D 2B1 2B3 4A 4E 4H 4M 4N
E2S 106 DA

(54) IMPROVEMENTS IN OR RELATING TO THE MANUFACTURE OF CONTAINERS OF SHEET MATERIAL

(71) We, ROEDER INDUSTRIAL HOLDINGS LIMITED of 3 Crawford Place, London W1H 1JB, England, a British company, do hereby declare the invention,

for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

The present invention relates to a process and an apparatus for the manufacture of an article in the form of a thin sheet having a profiled closure strip attached thereto the strip including at least one profiled fastener member.

The term "a profiled closure strip" is hereinafter used in relation to a longitudinally extending layer of material which is thin with respect to its width and which has upper and lower flat faces, the profiled member thereof being integral with the layer and upstanding from one of said faces.

It is known that, by joining to a sheet either two strips, the respective profiled fastener members of which are complementary, or a single strip comprising two such complementary members, it is possible in various ways and after transverse cutting and joining of the sheet and of the strip or strips at predetermined intervals, if required after longitudinal cutting, to obtain separate bags the width of which corresponds to the length of the intervals and which therefore are provided, by reason of the fastener members which can be connected together, with a convenient closure means, operable either by finger pressure or by means of a slider, the connection together being realised by elastic deformation of the fastener members.

Stated otherwise, the bags obtained by carrying out such a process have two thin walls, formed from the sheet material, which are joined together by two of their opposed edges so as to constitute the lateral edges of the bags and, if required, also by a third wall constituting the base of the bags. The base can remain open and need only be closed subsequently, after the bags have been filled with the merchandise which they are intended to contain. The two walls of the bags, in any case, are separate from one another along the edge opposite the base, in order to form an aperture for access to the contents of the bag, but the two edges of this aperture can be joined together and the aperture closed by means of two strips (one on each edge) having complementary fastener members which can interengage, either by pressure exerted along the strips or by means of a slider.

The two profiled closure strips can be secured to the same wall of the bag, on either side of a slit in this wall, which slit extends parallel to and slightly away from the edge opposite the base, or they can be fixed to the two opposed walls of the bag.

The bags of the kind mentioned above which are known in the prior art and which often serve for containing and selling articles which are consumed on a large scale, such as foodstuffs, clothing, utensils and so on, are generally of plastics material and this material is preferably transparent, to enable the intending purchaser to inspect the merchandise. The profiled closure strips are usually made of extruded plastics material.

According to a first known method of manufacture, the sheet and the closure strips are made in a single extrusion operation. This is a particularly slow and precise process to carry out, notably because of the considerable difference between the thickness of the sheet and that of the strips.

A second method of manufacture is preferred for this reason, one in which the sheet on the one hand and the profiled strips on the other hand are extruded separately, if required at different speeds and under different conditions of adjustment (temperature etc.), and then the strips are secured to the sheet by "welding" or sealing, either by

the direct application of heat, by the use of ultrasonics or otherwise.

In the first method of manufacture, the material constituting the profiled closure strips is evidently the same as that constituting the walls of the bags.

In the second, it is the same because, in the present state of the art, it is thought to be substantially impossible to join two different plastics materials one to the other at a mass production level.

This situation involves the inconvenience that it is impossible to choose for the profiled closure strips on the one hand and for the sheet intended to constitute the walls of the bags on the other hand the most exactly appropriate plastics material, having regard to the mechanical or optical qualities required for the part in question. In particular, it is impossible to obtain bags where the walls are of polypropylene, a material which is particularly suitable because of its transparency but which is relatively stiff, and where the closure strips are of polyethylene, a more opaque material which is especially useful because of its suppleness and its resistance to wear.

As regards more particularly the process of "welding" or sealing, there are a number of other disadvantages:

When two superposed sheets are moved together and two closure strips are simultaneously located one on each sheet along two adjacent free longitudinal edges of the sheets, it is necessary to provide between the two sheets, at the level of the heat-seal elements or other welding means, an insulating barrier which prevents the two sheets from becoming welded one to the other. The presence of such an insulating barrier invovles a considerable complication in the machine and supplementary friction effects impede operation at high speed of advance;

The "welding" or heat-seal temperature is very critical,particularly when the sheet is very thin and the profiled closure strips obviously are much thicker. If this temperature is somewhat too low, securement is uncertain and, if it is somewhat too high, there is a risk of destruction of the plastics material. Moreover, on cooling folds can occur in the thin sheet, due to its speed of cooling being too high, and the bags do not then have a satisfactory appearance;

It is impossible to obtain attachment of the closure strips across the whole of their width, because they evidently cannot be welded on to the sheet adjacent the fastener member. The strips can only be welded to the sheet at the web or webs which extend alongside the fastener member. The strips can only be welded to the sheet at the web or webs which extend alongside the fastener member. Since it is precisely this member which is directly subjected to strains during opening and closure of the bag, this disadvantage is self-evident;

The walls of such plastics bags frequently carry printed inscriptions, for example the mark identifying the product which they are intended to contain. Welding then has the supplementary disadvantage of the risk of damage to such inscriptions, and also the ink itself can become deposited upon the weld heads.

Manufacturers of bags of plastics materials accept these disadvantages, which in practice are considered unavoidable and necessarily inherent in this type of manufacture, because evidently they have never sought to remedy them.

On the contrary, before the considerable increase in usage of bags of the kind described above or their parts, the applicants have attempted to remedy the aforementioned disadvantages and in particular to work out a continuous and rapid process for the location and securement of profiled closure strips to a moving sheet which is to constitute the walls of the bags, for example in particular when the nature, thickness and optical or mechanical properties of the sheets and the strips are very different.

In accordance with one aspect of the invention there is provided a process of manufacture of an article in the form of a thin sheet having a profiled closure strip as hereinbefore defined attached thereto, in which a thin sheet is subjected to translatory movement in the direction of its major axis, a profiled closure strip including at least one profiled fastener member is subjected to translatory movement along its length parallel to such major axis and the sheet is brought into contact with a face of the strip in order to locate the strip on the sheet, and in which, before the thin sheet and the face of the strip are brought into contact, a layer of adhesive is deposited on such face and/or the regions of the sheet which are intended to contact it.

By the expression "high speed", it is intended to indicate here and also hereinafter a speed substantially higher than the feed speeds customarily used for the sheet and the strips when effecting securement between them by welding, namely a speed of the order of 100m/min at the least.

By the expression "substantially continuous", it is intended to indicate in particular that the glue or adhesive, which may be a plastics material of the "hot melt" type, is deposited in a continuous manner whilst the strip or strips and the sheet advance, without excluding any possible arrest of the sheet or of the strips, for example in order to replace reels, and any corresponding arrest of the deposit of the adhesive.

In the more particular case where a sheet

so equipped is intended to constitute the wall of the bag, of a wrapper or an envelope which is intended to be capable of ready and rapid closure, the strip can be one of a pair provided with elastically-interengageable complementary longitudinal profiled fastener members (if required being engageable through the intermediary of a separate member of the slider type), in order to provide a closure of the kind utilised for bags of plastics or other materials.

The layer of adhesive is preferably deposited on the profiled closure strips, because these are usually thicker than the sheet and so have better mechanical properties and deposit of the adhesive does not involve a risk of causing them to deviate, even slightly, from their intended path of movement.

The invention permits selection of the most appropriate material, on the one hand, for the sheet (whether or not it is intended to constitute the walls of bags) and, on the other hand, for the profiled closure strips. The fact that the nature and the thickness of the sheet and of the strips are very different does not pose any problem. In particular, it is possible to select for the sheet polypropylene and for the strips polyethylene. It is also possible to utilise a sheet of a material which is not weldable, for example, paper, or a composite sheet of a plastics material covered with paper or aluminium and, if desired, the strips can be fixed to the surface of plastics material or to the surface of the non-weldable material. There are thus a considerable number of different possibilities of manufacture.

Moreover, the necessity for providing an arrest in the advance of the sheet and of the strips for the application of a hot welding head, is eliminated, in such manner that the process can be conducted entirely continuously and very rapidly.

It will also be understood that the adhesive can be deposited over the whole width of the profiled closure strips and can thus ensure their attachment to the sheet even on the part of the face adjacent to the fastener member, so that there thus results a more efficient attachment and a better mechanical location of the profiled closure strips.

Moreover, when a printed sheet is utilised, there is no risk of damage to the printing, as is the case when carrying out a process of fixing by hot welding.

According to a particular method of carrying out the process, it is possible to provide that the contact and fixation by adhesion of the profiled closure strips on the sheet are carried out whilst the sheet is in a flat condition and folding of the sheet is then effected, following at least one fold line parallel to its axis, in order to bring the strips into a position relative to one another such that they then can be connected together.

In other words, adhesion of the profiled strips to the sheet is effected before effecting its folding.

According to another embodiment, it is possible to proceed so that a closure strip carrying respective ones of a pair of fastener members are contacted with the sheet on either side of and in the vicinity of the intended line of folding.

Open-base bags are thus obtained which can then be filled through their bases and the opposite extremity of which above the closure remains closed along such fold line, thus constituting a safety device which the user can cut off in order to obtain access to the closure and thus to the contents of the bag (a closure of the so-called "tamper-proof" type).

According to a further embodiment, it is possible, on the other hand, to cause two closure strips each carrying one of a pair of complementary fastener members to contact the sheet on either side of the intended fold line and respectively at the locations of the two free lateral edges of the sheet.

Closed-base bags are thus obtained and their filling is effected necessarily by way of the opening adjacent to the closure strips.

In a preferred process according to the invention two thin sheets are advanced in a flat state parallel to one another, at least two closure strips having respective complementary profiled fastener members thereon being secured by adhesive one to each sheet, by way of their faces opposing such sheets.

The two strips in question are then advantageously connected together whilst they are being introduced between the two sheets.

Also, it is possible to secure one or more strips, each carrying two complementary fastener members, between the two sheets, by means of adhesive, each strip being folded longitudinally such that its fastener members are joined together or thus can be joined together. In this case, one strip can thus be adhered along each pair of the lateral edges of the two sheets between their internal faces, the longitudinal folds of such strips being directed towards the exterior. Bags can thus be obtained after axial cutting of the two sheets and transverse cutting and rejoining.

These bags thus have an open base and their closure is of the so-called "tamper-proof" type, so that it is necessary to cut the strips along their longitudinal fold line between the two profiled fastener members in order to open the bags.

Furthermore, two separate strips can be secured by adhesive, one to each sheet, along the lateral edges of the sheets. Open-base bags are again obtained, but with closures which are not tamper-proof.

It is also possible, in the case where two thin sheets are advanced in flat condition parallel to one another, to make one of the sheets less wide than the other and adhere the strips each carrying one of complementary profiled fastener members in the vicinity of the common longitudinal axis of the two sheets. Again, bags with an open base are thus obtained, but with a flap, which facilitates separation of the two walls of the bags, for introduction of the articles which they are to contain.

According to another process, it is possible to effect folding of a sheet along at least one fold line parallel to its axis and to arrange contact between and securement by adhesive of the profiled closure strips to the sheet in a relative position such that the complementary fastener members can be joined together.

In other words, folding is at least partially effected before adhesion.

According to a variant of this embodiment, the two strips carrying respective complementarily profiled fastener members are respectively brought into contact with each ply of the sheet, in the vicinity of the two free lateral edges of the sheet.

Bags with closed bases are thus obtained.

When the location and attachment of profiled strips is effected upon an already-folded sheet, it is advantageous to arrange, in conjunction with the mode of operation described above, that two fastener members of a pair of strips are firstly joined together and are then positioned as so assembled between the two folds of the sheet.

This arrangement has the advantage of simplifying the guidance of the closure strips and making them more rigid, since they then behave as a single closure strip, which is thicker and thus has better mechanical properties.

Advantageously, a process in accordance with the invention in one or other of the embodiments previously described can also be further improved in that, after adhesion of the profiled closure strips to the sheet and before transverse cutting and reuniting of the sheet and the strips at predetermined intervals, the sheet and the strips are rolle intervals, the sheet and the strips are rolled up at high speed around an intermediate roller, the reels thus obtained being capable of treatment subsequently in transverse cutting machines operating at a lower speed.

The transverse cutting of the sheet and of the strips in order to obtain separate bags thus does not cause any deceleration of the rate of production. The parallel movements of the sheet and the closure strips, adhesion of them to the sheet and the intermediate rolling up can be carried out at high speed and the transverse cutting can be carried out at a lower speed, but on several machines operating in parallel and thus the overall output can be the same as that of a single adhesion machine. This supplementary arrangement thus allows manufacture at a high yield and with a considerably increased throughput, of the order of three to four times, with respect to the prior process of attachment of closure strips by welding, in which the welding operation itself can only be carried out during arrest of the advance of the sheet and of the strips.

A process of operation according to the invention can also be subjected to other variants, some of which will be described below in a more detailed fashion, with reference to the accompanying drawings and according to which, to make the process even more rapid, use can be made of at least one closure strip comprising at least one pair of profiled fastener members, which may or may not be complementary, such strip preferably being obtained by extrusion. This strip can be located and glued in place concurrently with strips having a single fastener member, before or after one or more longitudinal foldings of the sheet.

According to the invention also an apparatus for carrying out a process as defined above comprises, means for supplying, transporting and guiding a sheet and capable of subjecting it to translatory movement along its major axis, means for supplying, transporting and guiding, parallel to and in the vicinity of the sheet, a profiled closure strip as hereinbefore defined, and including guiding means for supporting a substantial portion of the width of one of said flat faces, means for depositing an adhesive on the other of said flat faces of the strip and/or on the region of the sheet intended to come into contact with it and means for effecting and maintaining contact between the sheet and the strip.

Such a machine can also comprise means for transversely cutting and reuniting the sheet and the strip or strips at predetermined intervals, in order to obtain separate articles.

Moreover and preferably, the means for supplying, transporting and guiding the sheet and/or the strip or strips are arranged so as to subject them to a continuous translatory movement at high speed and the machine also comprises means for rolling up the adhering sheet and strip(s). The machine may be associated with other machines operating in parallel and arranged so as to effect the operations of transverse cutting and reunion of the sheet and of the strip(s).

There may also be provided other improved arrangements of the apparatus, in particular, in connection with the adhesive depositing means and also in relation to the means for guiding two connected closure strips.

A further advantageous feature comprises

an adhesive applying nozzle, which is particularly suitable for continuously applying adhesive to the profiled closure strips whilst they advance, the nozzle comprising an outlet orifice leading from an interior conduit connected with a reservoir of adhesive. The particular improvement in such a nozzle, according to the present embodiment, is that the regularity of the deposit of adhesive is considerably improved, both as to its depth or thickness and as to its width.

The nozzle is provided with an orifice which, in relation to the intended direction of movement of the strips on which the adhesive is to be deposited, includes a shoulder formation opening on to its upper face, which defines a gap of predetermined depth on the downstream side in relation to the direction of advance of the strip.

It can be seen that, by virtue of this arrangement, a space which is of strictly constant depth corresponding to the selected depth of the deposit of adhesive is provided between the downstream side of the end of the nozzle and the surface of the strip on which it is desired to deposit the adhesive. Effectively, a deposit of adhesive is obtained having a depth (thickness) and a width which are extremely regular and without unevenness at the edges of the band of adhesive, which substantially increases its aesthetic qualities. Also, the risk is considerably decreased of having the outlet orifice of the nozzle blocked by means of dirt.

Moreover, it has been noted that this kind of nozzle can very rapidly reproduce the same regularity when again brought into use after a more or less prolonged shut-down, both as regards the thickness and the width of the deposit of adhesive.

When the interior conduit of the nozzle has an elongated transverse cross-section, it is advantageous in particular to arrange that the shoulder formation, as seen in elevation, has the form of an aperture which is substantially uniform depth and rectangular in shape.

Preferably, the shoulder formation is produced by removal of metal. There is thus very readily obtained a shoulder formation of the desired depth, particularly when the nozzle is constituted by a relatively soft metal such as brass. Preferably, the shoulder formation has a depth of the order of 0.1 mm and a width of the order of 5 mm.

There may also be a further improvement in the means for guiding two closure strips having inter-connected fastener members, comprising two guide plates defining between them an aperture having parallel or substantially parallel edges for the passage and guidance of the connected fastener members and capable of being introduced between the slightly spaced webs of the two closure strips.

This guide arrangement is such that the apparatus has a form so that it can effectively guide two complementary closure strips having connected fastener members, the two strips already being coated with adhesive, so that it can then bring the two connected strips between the two plies of the sheet, for example of plastics material, which after transverse cutting will constitute the walls of the various bags.

For this purpose, the guide means of the type just mentioned are arranged so that the plates are fixed between two support members which, when assembled, form between them a passageway for the connected and adhesive-coated strips, the two support members thus forming a wedge-shaped assembly which can be introduced between the two plies of a sheet and which has a free edge extending substantially parallel to the axis of the aperture through which the connected strips pass.

Other advantageous characteristics of such a machine will also be described in detail below with reference to the figures of the accompanying drawings, together with the advantageous features of the bags so obtained.

Referring to the accompanying drawings:

Figs 1*a* and 1*b* show a first way of carrying out a process according to the invention;

Figs 2*a* and 2*b* show a second embodiment of this process, utilising a single closure strip;

Figs 3*a*, 3*b*, 4*a* and 4*b* show two other embodiments, according to which use is made of at least one closure strip carrying a plurality of fastener members;

Fig 5 shows a fifth embodiment of the process;

Fig 6 shows yet a further embodiment, according to which use is made of a plurality of closure strips, located on the sheet after folding thereof;

Fig 7 shows in perspective and partly diagramatically a machine for carrying out a process in accordance with the invention;

Fig 8 shows in perspective means for guiding two strips of profiled fastener members, utilisable in the machine of Fig 7;

Figs 9*a*, 9*b*, 9*c* and 9*d* show in transverse secton two sheets advancing parallel to one another and on the internal faces of which strips of profiled fastener members are adhered, particularly for the manufacture of bags;

Fig 10 shows a product according to the invention, constituted by a strip adhered to a protective sheet;

Fig 11*a* shows a partial view in axial section of an improved form of adhesive-applying nozzle;

Fig 11*b* shows an end elevational view of the nozzle of Fig 11*a*;

Fig 12 shows in perspective an improved guide means.

Referring to Fig 1*a*, reference 1 shows a thin sheet, for example polypropylene. This sheet 1 is made to advance in a continuous manner at high speed, following the direction of its longitudinal axis, namely a direction perpendicular to the plane of the drawing. Two closure strips 2 and 3 are advanced parallel to and in the vicinity of each of the free edges of such sheet, at the same speed, one closure strip 2 carrying a male fastener member 2*a* and the other carrying a female fastener member 3*a*. These two strips are also of plastics material, for example extruded polyethylene. A layer 4 of a suitable adhesive, if required of the so-called "hot melt" kind, is deposited in a continuous manner on those faces of the strips which are opposite to their fastener members and they are then applied by way of these faces to the sheet 1. Then, in a first stage, the sheet 1 is folded along its longitudinal axis, indicated by the chain-dotted line 5. A folded sheet is thus obtained as shown in Fig 1*b*, the members 2*a* and 3*a* coming opposite one another so that they can be connected together, if desired. After this, in a second stage, the resultant assembly is transversely cut through the two opposed walls 6 and 7 and joined, for example by heat-sealing at predetermined intervals corresponding to the width desired for the resultant bags. Finally, bags with closed bases are thus obtained. In the heat-sealing or welding phase, it will be noted that the ends of the closure strips 2 and 3 are also heat-sealed or welded together, because they oppose one another.

In Fig 2*a* an embodiment is shown diagramatically in which use is made of a single closure strip 8, made in a single step, for example by extrusion, but which comprises two complementary fastener members 8*a* and 8*b*. On the face of the strip 8 which is opposite the members, a thin layer of adhesive is deposited by means of a nozzle 9, supplied in any desired manner, not shown, from a reservoir of adhesive. The adhesive coated face is then brought into contact with a plastics material sheet 10, along the axis of such sheet, the latter and the strip 8 being subjected to a displacement at the same speed, (in the direction of the arrow 11). In order to ensure transport and guidance of the sheet and of the strip, a rotary pressure roller 12 is provided below them and, above the strip 8, a rotary pressure roller 13. The latter includes two grooves 14 which provide for the passage and guidance of the upstanding members 8*a* and 8*b*.

Subsequently, the sheet 10 and the strip 8 are folded along the axis of the sheet, namely along a central longitudinal line passing between the two fastener members, as a result of which a folded sheet with two opposed walls 15, 16 is obtained, such as shown in Fig 2*b*. The chain-dotted line 17 corresponds to the fold line. The two members 8*a* and 8*b* can be connected together during folding of the sheet and superposition of the two walls 15, 16 upon one another. Consequently, after transverse cutting and joining of the walls 15, 16 at predetermined intervals, separate bags are obtained having open bases (reference 18) through which they can be filled. It is to be noted that the bags obtained in this case have at their ends opposite their bases a safety closure, corresponding to the central part of the strip 8 and sheet 10, which the user has to cut before obtaining access to the closure members, in order to separate them and so obtain access to the contents of the bags. In order to facilitate cutting, it will be understood that a weakening line is provided in the central part of the strip 8.

In Fig 3*a*, another embodiment is shown in which there are brought into contact with a sheet 19 undergoing continuous advance, firstly, along the axis of the sheet (indicated by the chain-dotted line 20) a closure strip 21, comprising two non-complementary fastener members, (for example, of the female type) indicated at 21*a* and 21*b* and, secondly, along each of the free edges of the sheet, a closure strip 22, each comprising fastener member complementary to the foregoing (for example, of the male type) respectively indicated at 22*a* and 22*b*. It will be understood that, as in the preceding embodiments, in order to ensure contact between the sheet 19 and the faces of the strips which opposed their members, a thin layer of adhesive (reference 23) is deposited upon these faces.

The sheet 19 is then folded along two longitudinal lines 24 so that the member 22*a* faces the member 21*a* and, if desired, is connected to it and that the member 22*b* faces the member (21*b* and, if desired, is connected to it (Fig 3*b*). Then, in a continuous manner, the sheet 19 and the central part of the strip 21 are cut longitudinally along the axis 20 by means of a cutter 25. After transverse cutting and seaming of the sheet and the strips, separate bags are obtained having closed bases, analogous to those of Fig 1*b* or double bags of the wallet or "pocket-book" type.

In Fig 4*a*, another embodiment is shown, in which two closure strips 27 and 28 are located and fixed by adhesive upon a sheet 26 undergoing continuous displacement, along two longitudinal lines 29 located on the sheet on either side of its axis 30. Each strip 27 and 28 comprises a male member 27*a* and 28*a* respectively and a female member 27*b* and 28*b* respectively. The sheet 26 and

the strips 27 and 28 are then folded longitudinally along lines 29, so that the members 27*a*, 27*b* on the one hand and 28*a*, 28*b* on the other hand oppose one another and can thus be connected together (Fig 4*b*). After this, the sheet 26 is cut longitudinally along its axis 30 by means of a cutter 31. In this way, bags with open bases can be obtained, as in the case of Fig 2*b*.

In the mode of operation shown in Fig 5, the procedure is different, in that one of the closure strips, for example a strip 32 with a male member 32*a*, is provided with a layer of adhesive on its face which is situated alongside the member. This strip is thus glued to one of the longitudinal edges 33 of an already folded sheet 34, namely on the external edge of the sheet, whilst a closure strip 35 having a female member 35*a* is glued to the other longitudinal edge 36 of the sheet 34, on its internal edge. In this way, separate bags with closed bases are obtained, but one of the closure strips will be visible at the exterior, independently of the fact that the walls of the bags can also be transparent.

An industrial manufacture of such bags and a form of this procedure are shown diagramatically in Fig 6. According to this embodiment, a sheet 37 is continuously folded initially along two longitudinal lines spaced from its axis, indicated at 38, so that the two free longitudinal edges of the sheet, shown at 39, are directed toward one another. Thereafter, a closure strip 41 is located on the axis of the sheet and glued in place upon the internal face 40 of the lower fold, the closure strip 41 comprising two non-complementary fastener members 41*a* and 41*b*. At the same time, two closure strips 43, having fastener members complementary to the foregoing and indicated at 43*a* and 43*b* are located on and glued along the edges 39 of the sheet, on the external face 42 of the upper fold. Preferably, interconnection of the members 41*a*, 43*a* on the one hand and 41*b*, 43*b* on the other hand is effected before the location and adhesion of the strips upon the sheet 37.

In order to ensure guidance of the sheet and of the strips, a rotary pressure roller 44 is provided below the sheet 37 and a rotary pressure roller 45 is provided above the sheet and the strips, the latter roller including grooves 46 for receiving and guiding the strips. Three adhesive supply nozzles are indicated at 47. When these various adhesion operations have been carried out, longitudinal cutting of the sheet 37 and of the strip 41 is effected substantially in the middle of the adhesion zone 48, so that after transverse cutting, bags with closed bases are obtained of the kind shown in Fig 5.

In Fig 7, a machine is shown diagrammatically and partially for carrying out a process in accordance with this invention.

This machine is supplied with a sheet 49 of plastics material which unwinds continuously and at high speed from a supply reel, not shown, the sheet being folded upon itself by means of a standard triangular folding device 50, in order to form two plies 51 connected together at a fold line 52. The two plies 51 progressively approach one another, so as finally to come into face-to-face contact below two guide rollers 53 which extend horizontally from the upper point 54 of the triangle 50. Rollers for guiding the sheet 49 to the triangular device 50 are shown at 55 and 56.

The machine is also supplied at the same speed with two closure strips 57 and 58, the complementary fastener members of which are connected together so that these two strips effectively comprise a single closure strip 57, 58 which is flat on its two sides. The strip 57, 58, derived from a supply reel likewise not shown, passes around a guide roller 59 and then between the two rollers 53 so that its path of movement coincides with that of the two facing free edges 60 of the two plies 51, when these have come together. In this manner and very conveniently, a sandwich structure is obtained in which the strip 57, 58 is located between the free longitudinal edges of the plies 51 of the sheet 49. Upstream of the region where the strip 57, 58 becomes located between the two plies 51, that is to say upstream of the rollers 53, two adhesive supply nozzles 61 and 62 are located which are connected to a fixed support represented only partially and indicated by reference 63. These two nozzles 61, 62 are supplied with a liquid adhesive in any desired manner (likewise not shown in order to keep the drawing clear), for example by way of flexible hoses connected to a reservoir containing a heated liquid adhesive, the hoses and the reservoir itself preferably being heated, in order to avoid the adhesive from setting and polymerizing prematurely.

The nozzles 61 and 62 discharge at either side of the strip 57, 58 and in the immediate vicinity of the flat opposed surfaces of such strip, so that the adhesive is distributed uniformly on these two surfaces in the form of a thin layer.

In this manner, the adhesion of the profiled connection strips 57 and 58 to the internal faces of the plies 51, along their free edges, is thus obtained. The sheet thus folded and provided with the two closure strips 57 and 58 is finally rolled up on a storage reel 64 or it can simply be introduced into a heat-sealing machine.

It will be seen that all the operations which have been described can proceed in a totally continuous manner and at a very high speed, without any interruption or deceleration of the supply of the sheet 49. This speed is

considerably higher than that of machines of the type which affixes closure strips by heat-sealing, because it can attain values of the order of 200 to 300 m/min.

The various terminal storage reels 64 obtained on such a machine can then be further treated on several standard machines operating in parallel and at a lower speed, effecting the transverse cutting and sealing operations, at spaced intervals, upon the two plies 51 and the closure strips, in such a manner as to obtain a very high output of individual bags of the kind shown in Fig 1*b*.

The machine shown in Fig 7 is also provided with guide means for the strip 57, 58 between the nozzles 61 and 62. These guide means are shown separately in Fig 8, so as not to encumber the drawing of Fig 7.

The nozzles 61 and 62 are slightly spaced apart from one another in the vertical direction and the guide means are arranged so as to ensure satisfactory lateral guidance of the strip 57, 58 and so as to be able to pivot about the axis of a horizontal shaft 65 located at an intermediate level between the nozzles 61 and 62, so that the strip is deflected and spaced simultaneously from the outlets of the two nozzles during shutdown of the machine. This expedient prevents the nozzles, which are at a relatively elevated temperature, from causing deterioration of the strip 57, 58, when the latter isnot moving. For this purpose, the guide means in question, shown very diagrammatically, comprises two guide plates 66 connected by a bridge member 67 itself supported by the spindle 65 and defining between them a gap 68 for the passage of the two inter-connected profiles 69. The facing edges of the plates 66 are received between the slightly spaced plies of the strips 57 and 58, which provides them with a very precise guidance and allows them to be separated sufficiently from the two nozzles 61 and 62, during their rotation around the spindle 65. This rotation can be controlled automatically, for example with an electromagnetic device, the movable element 70 of which is attached to a lever 71 connected to the bridge member 67.

It can be seen that various other guidance means can be provided in order to carry out the same functions.

Figs 9*a* to 9*d* show in tranverse other variants of the products which can be obtained in accordance with the processes of the invention. According to these various embodiments, profiled closure strips which are preferably already connected together are not introduced between the two plies of a sheet, but between two sheets 72, 73, which are made to advance parallel to one another.

In Fig 9*a*, the two sheets have equal widths and two strips 74, 75 having complementary fastener members, are fixed between them, namely to their opposing faces, by means of adhesive. Each strip comprises a male member 74*a*, 75*a* and a female member 74*b*, 75*b* joined together and each is folded longitudinally between the two members, the fold of the strip being directed towards the exterior.

It can be seen that, after longitudinal cutting of the two sheets along their common axis and transverse cutting and welding or heat-sealing, open-base bags will be obtained, without a slit, but with a security seal. The user then cuts along the strips in order to obtain access to the fastener members so as to separate them.

Fig 9*b* is distinguished from Fig 9*a* in that each strip 74 and 75 is replaced by two separate strips 76*a*, 76*b* and 77*a*, 77*b* respectively. Open-base bags are still obtained, but without security seals.

In the method of operation of the two foregoing figures, the profiled closure strips are fixed along the lateral edges of the two sheets.

In the method of operation of Figs 9*c* and 9*d*, on the contrary, the profiled closure strips are fixed to the central part of the two sheets, on either side of their common longitudinal axis, the sheet 72 also having a width somewhat less than that of the sheet 73.

In the case of Fig 9*c*, two separate pairs of strips 78*a*, 78*b* and 79*a*, 79*b* have been provided. In the case of Fig 9*d*, it is only necessary to adhere a single strip to each sheet, the one, 80*a*, having two male members and the other, 80*b*, having two complementary female members.

In the two cases, after longitudinal cutting of the two sheets along their common axis and transverse cutting and seaming of the sheets and the strips, open-base bags with flaps are obtained, the flap facilitating separation of the two walls of the bags in order to fill them.

It is to be noted that the four methods of operation represented above have the advantage of allowing the selection, for the sheets 72 and 73, of sheets of different colours.

Fig 10 shows another type of product which can be manufactured in accordance with processes of the invention. It is a plastics material strip 81, for example of polyethylene, provided with two fastener members 82, for example in the form of ribs or grooves, having a band of adhesive 83 disposed above the members but on the face opposed to them. This adhesive band 83, as in the embodiments already described, can be deposited in a continuous fashion during longitudinal advance of the strip 81. The adhesive band 83 is covered with a protective band 84 of paper which does not adhere in a permanent manner to the adhesive and which the user can pull off prior to use.

The nozzle shown in Figs 11*a* and 11*b*

comprises a nozzle body 101 having a generally conical extremity 102. This extremity in effect has the form of a cone having a truncated apex which is flattened in a direction transverse to that of the outlet orifice of the nozzle, which is in the form of an elongated slot 103. The slot or orifice 103 communicates with an internal adhesive supply conduit 104 and extends over a length, for example 5 mm, corresponding to the width of the band of adhesive which it is desired to deposit on the closure strips. As regards the width of the slot 103, it is 0.25 mm, for example.

The extreme surface 105 of the nozzle, in relation to the path of movement of the strips to be glued, includes a portion 106, which is rectangular in the example shown and is spaced towards the conduit 104, for example by 0.1 mm, so that adhesive is beneath this portion which lies in the direction of advance of the strips to be glued, indicated by reference 108 and 109. The arrow (Fig 11*a*) indicates the direction of advance of the two strips.

As the nozzle is preferably made of brass, the shoulder formation or gap 106 can readily be provided by removal of the metal with a rectangular cutter.

In operation, there is obtained at the outlet, downstream from the slot 103 between the surface of the nozzle extremity and the surface to be glued, a supply of adhesive of a totally pre-determined thickness, which is fed continuously from the slot or orifice 103.

This arrangement allows a band of adhesive 110 to be obtained having a totally predetermined thickness and width and with sharp edges. Also, this considerably decreases the risks of blockage of the slot 103 by means of dirt and, on start-up after a more or less prolonged shutdown, it is possible substantially immediately to recover the normal regularity of the band of adhesive.

Fig 11*a* shows only a single nozzle for applying adhesive to the closure strip 109, but it is clear the that the same nozzle disposed below the two interconnected strips could be utilised to effect the application of adhesive to the strip 108, with the same advantages.

In Fig 12, guide means according to a preferred feature of the invention are shown, for guiding the two connected strips 108 and 109, comprising two guide plates 111 and 112 defining between them a slot or aperture 113 having parallel edges, for the passage and guidance of the connected fastener members 114. The guide device shown in Fig 12 is arranged so as to guide the two strips 108 and 109, joined together by interconnection of the profiles 114 and already coated with adhesive, between the plies 115 and 116 of a previously folded sheet, for example of plastics material, which sheet after the usual transverse cutting and welding or heat-sealing operations, will constitute the walls of the final bags.

For this purpose, the two guide plates 111 and 112 are fixed by means of screws between two support members 118 and 119 which have such shape that after their connection they constitute an elongated guide duct or passageway through a wedge-shaped guide assembly 117. The tapering lower part 120 of this assembly 117 includes an edge 121 parallel to the axis of the slot 113. This edge 121 can maintain a sufficient spacing or separation between the longitudinal marginal parts of the plies 115 and 116 of the sheet and thus ensures the introduction and guidance of the two interconnected strips 108 and 109 whilst undergoing displacement in the desired manner. On leaving the assembly these marginal parts of the plies of the sheet can come together again without leaving any intermediate spacing, and thus become applied against the adhesive bands 110. The assembly of the sheet 115, 116 and the strips 108, 109 will then become pressed together whilst passing between two guide rollers 122, 123.

The invention thus provides many different ways and forms of apparatus for making bags and other structures and parts thereof, such as are illustrated in the drawings, including the product which combines a closure strip 81 to which is removably adhered a backing paper 84 shown in Fig. 10.

With further reference to the product of Figure 10, after the removal of the paper 84, the profiled strip can then be glued to any desired surface, for example by the simple application of pressure, for example to a wall. Any desired product can then be fixed to this strip, if it is provided with complementary fastener members, for example a planning sheet, a supporting element or the like, the advantage residing in the fact that such a product is very readily put into place and removed. It is sufficient simply to connect together and disconnect the profiles of the strip and the complementary profiles of the product.

It will be noted in the light of the foregoing that the invention provides a very large number of advantages with respect to processes according to which a closure strip is fixed to a sheet by heat-sealing; among these advantages, the following can be cited:

the possibility of fixing a strip to a sheet of a different material or to a sheet having a thickness which is much less; in particular, adhesion, as opposed to heat-sealing ("welding"), does not cause thermal damage to the strip nor any deformation of the strip or of the sheet itself;

manufacture at a very much higher speed;

simplication of the machines or other handling apparatus;

the possibility of fixing the strip along the whole of its width;

the possibility of using printed sheets.

WHAT WE CLAIM IS:-

1. A process of manufacture of an article in the form of a thin sheet having a profiled closure strip as hereinbefore defined attached thereto, in which a thin sheet is subjected to translatory movement in the direction of its major axis, a profiled closure strip including at least one profiled fastener member is subjected to translatory movement along its length parallel to such major axis and the sheet is brought into contact with a face of the strip in order to locate the strip on the sheet, and in which, before the thin sheet and the face of the strip are brought into contact, a layer of adhesive is deposited on such face and/or the regions of the sheet which are intended to contact it.

2. A process according to claim 1 wherein said translatory movements are effected at a high speed as hereinbefore defined.

3. A process according to claim 1 or claim 2 wherein said translatory movements are effected substantially continuously as hereinbefore defined.

4. A process according to any preceding claim, wherein the adhesive is applied as a continuous layer.

5. A process according to any preceding claim, wherein the said translatory movements of the sheet and strip are effected at the same speed.

6. A process according to any preceding claim, wherein the said sheet and strip are brought into contact and joined together at a predetermined common point in the respective paths of movement and are held one against the other in a region immediately downstream of said common point and wherein the adhesive is applied immediately upstream of said common point.

7. A process according to any preceding claim in which, after said sheet and said strip have been joined together, they are severed at predetermined intervals along said axis.

8. A process according to any preceding claim, in which one closure strip carrying on one face thereof a pair of complementary interengageable fastener members is joined to said sheet or two closure strips each carrying on one face thereof one of a pair of complementary interengageable fastener members are joined to said sheet.

9. A process according to claim 8, in which the contact and location by adhesive of the closure strip or strips on the sheet is effected whilst the sheet is in a flat condition, folding of the sheet along at least one fold line parallel to its axis then being effected, in order to bring the pair of fastener members into relative positions such that they can be connected together.

10. A process according to claim 9, in which said two closure strips are brought into contact with the sheet one on either side of and in the vicinity of the intended fold line.

11. A process according to claim 9, in which said two strips are brought into contact with the sheet one on either side of the intended fold line and respectively in the vicinity of the two free lateral edges of the sheet.

12. A process according to any of claims 1 to 7, in which two thin sheets are advanced in a flat condition parallel to one another and two closure strips each carrying one of a pair of interengageable fastener members are coated with adhesive and applied one to each sheet on the opposing faces of such sheets.

13. A process according to any of claims 1 to 7, in which two thin sheets are advanced in a flat condition parallel to one another and at least one closure strip carrying a pair of complementary interengageable fastener members is located between and secured by adhesive to the two sheets, the or each strip being folded longitudinally such that the pair or pairs of fastener members are connected together or can be connected together.

14. A process according to any of claims 1 to 7, in which the sheet is folded along at least one fold line parallel to its axis, contact and location on the sheet by adhesive of a pair of closure strips each carrying one of a pair of complementary interengaging fastener members being then effected in relative positions such that the complementary strips can be coupled together.

15. A process according to claim 14, in which the two closure strips are brought respectively into contact with each ply of the folded sheet, in the vicinity of the associated free lateral edge of the sheet.

16. A process according to claim 15, in which the two complementary fastener members of the two closure strips are first connected together and then brought into place between the two plies of the folded sheet.

17. A process according to any preceding claim, in which, after adhesion of the closure strip or strips to the sheet or sheets and before transverse cutting and connection of the sheet or sheets and the strip or strips at predetermined intervals, the sheet or sheets and the strip or strips are rolled up at high speed on an intermediate reel.

18. A process according to any one of claims 1 to 7, in which at least one closure strip is utilised which carries at least one pair of fastener members, which may or not be complementary interengaging fastener members, which may or not be complementary interengaging fastener members, the strip

being a one-piece member.

19. A process according to claim 18 in which the or each strip is an extruded strip.

20. A process according to claim 18 or claim 19, in which one closure strip carrying a pair of complementary interengaging fastener members is located substantially on the axis of a sheet and, after adhesion of such strip to the sheet, the sheet and the strip are folded substantially along the axis of the sheet and along a longitudinal line passing between the two fastener members, transversely severed and joined, whereby articles in the form of open-base bags are obtained.

21. A process according to claim 18 or 19, in which two closure strips each carrying a pair of complementary interengaging fastener members are located one on either side of and spaced from the axis of a sheet and, after adhesion of the strips to the sheet, the sheet and the strips are folded along two longitudinal lines passing between the two fastener members of each strip, the sheet is longitudinally transversely severed and joined whereby articles in the form of open-base bags are obtained.

22. A process according to claim 18 or claim 19, in which a closure strip carrying two non-complementary fastener members is located substantially along the axis of a sheet and, along each of the longitudinal edges of the sheet, a closure strip is located which carried a fastener member which is complementary to one of the fastener members of the first-mentioned closure strip, and in which, after adhesion of the three strips to the sheet, the sheet is folded along two longitudinal lines which pass between each two adjacent complementary profiles and longitudinally cut along its axis and along a line passing between the two non-complementary fastener members of the first-mentioned closure strip, the sheet and strips transversely severed and joined, whereby articles in the form of closed-base bags are obtained.

23. A process according to claim 15, in which after folding of the sheet one of the closure strips is located on and adhered to its internal face and the other is located on and adhered to its external face, along its free longitudinal edges.

24. A process according to any one of claims 1 to 7, in which the sheet is folded along two longitudinal lines spaced from its axis, the two free longitudinal edges of the sheet then being face-to-face, a closure strip carrying two non-complementary fastener members is located on and adhered to the internal face of the sheet substantially along the axis of the sheet and closure strips each carrying a fastener member complementary to the fastener members of the first-mentioned closure strip is located upon the external face of the sheet, the sheet and the first-mentioned strip is cut along said axis and the sheet and the strips are transversely severed and joined, whereby closed-base bags are obtained.

25. A process according to claim 1, substantially as herein described with reference to Figures 1*a* and 1*b*, Figures 2*a* and 2*b*, Figures 3*a* and 3*b*, Figures 9*a* to 9*d*. Figure 10, Figures 11*a* and 11*b* or Figure 12 of the accompanying drawings.

26. A plastic bag or other article comprising at least one strip attached to a thin sheet, when made by a process according to any preceding claim.

27. An apparatus for carrying out a process according to any preceding claim, which comprises means for supplying, transporting and guiding a sheet and capable of subjecting it to translatory movement along its major axis, means for supplying, transporting and guiding parallel to and in the vicinity of the sheet a profiled closure strip as hereinbefore defined and including guiding means for supporting a substantial portion of the width of one of said flat faces, means for depositing an adhesive on the other of said flat faces of the strip and/or on the region of the sheet intended to come into contact with it and means for bringing about and maintaining contact between the sheet and the strip.

28. An apparatus according to claim 27, which includes means for transversely cutting and joining the sheet and the strip at predetermined locations in order to obtain separate articles.

29. An apparatus according to claim 27, wherein the means for supplying, transporting and guiding the sheet and the strip are arranged to subject them to continuous translatory movement at high speed as hereinbefore defined, storage means for rolling up the sheet and the adhered strip being provided, the apparatus also being associated with other apparatus operating in parallel and arranged to effect the operations of transverse cutting and reuniting of the sheet and the strip or strips at predetermined intervals to obtain separate articles.

30. An apparatus according to any of claims 27 to 29, wherein the means for supplying, transporting and guiding the sheet comprise means for effecting folding of the sheet substantially along its longitudinal median axis to form two plies which progressively approach one another, the means for supplying, transporting and guiding the strip being arranged to bring two complementary interengaging fastener members carried by the strip or one by each of two strips between the two plies of the sheet and in the vicinity of their free edges, said adhesive depositing means being located upstream of the location of contact between the plies of the sheet and the strip or strips

and arranged to deposit a thin layer of adhesive on the faces of the strip of strips opposite to that supporting the fastener members.

31. An apparatus according to claim 30, in which the means for depositing an adhesive comprise two adhesive supply means disposed one on either side of the strip or strips and spaced from one another in the direction of advance of the strip or strips.

32. An apparatus according to any of claims 27 to 31, wherein the adhesive applying means comprises a nozzle having an outlet orifice from an interior conduit in connection with a reservoir of adhesive, the orifice having an outlet slot which defines with respect to the path of movement for the strip or strips an exit area feeding on to the uppermost face in front of the slot in relation to the direction of advance of the strips.

33. An apparatus according to claim 32, in which the conduit has an elongated transverse section, and the exit area from the nozzle comprises a shoulder or step formation which, in elevation, is in the form of an opening of substantially uniform depth which is substantially rectangular.

34. An apparatus according to claim 33, in which the step formation is made by the removal of metal.

35. An apparatus according to claim 33 or 34, in which the step formation has a depth of the order of 0.1 mm and a width of the order of 5 mm.

36. An apparatus according to any of claims 31 to 35 for use with two strips each having one of a pair of fastener members and in which the means for guiding the two strips comprise a guide member for taking the strips between the supply means, the guide means being arranged to pivot the strips about an axis transverse to the direction of advance, located substantially at the mid-point between the two supply means.

37. An apparatus according to claim 36, in which the guide member comprises a plate provided with a slot disposed in the direction of advance of the strips, for lateral guidance of the connected fastener members, the two opposed longitudinal edges of the slot engaging, for such transverse guiding, between the webs of the two strips.

38. An apparatus according to claim 36 or 37, in which the guide member is pivotally mounted on a fixed axis transverse to the direction of advance of the strips and connected by remote control means including an electromagnet, so that it can be pivoted during arrest of the advance.

39. An apparatus according to any of claims 31 to 35, in which the guide means comprise two guide plates defining between them a slot having parallel or substantially parallel edges for the passage and guidance of the interconnected fastener members and capable of passing between the slightly spaced webs of the strip or the two strips, the plates being fixed between two support members which define between them a passageway for the receipt of the interconnected and adhesive-coated strips, the two members thus forming a wedge which can be inserted between the two plies of a folded sheet so that the free edges thereof extend substantially parallel to the axis of the slot.

40. An apparatus according to claim 28, substantially as herein described with reference to Figure 6, Figures 7 and 8, Figures 11*a* and 11*b*, or Figure 12, of the accompanying drawings.

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Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1979.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from whom copies may be obtained.

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6 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

FIG.1a.

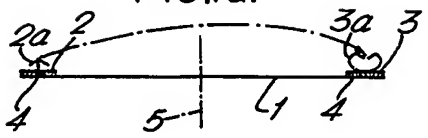


FIG.1b.

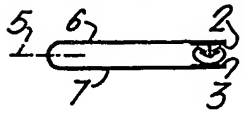


FIG.3a.

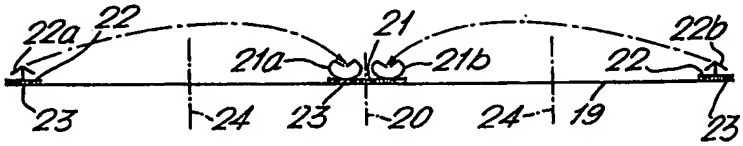


FIG.3b.

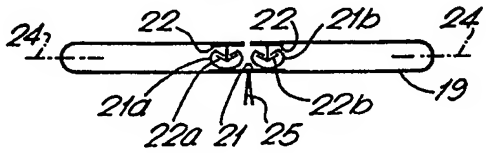


FIG.4a.

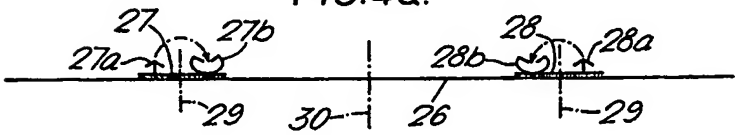
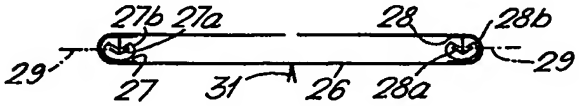


FIG.4b.



1546433 COMPLETE SPECIFICATION
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Sheet 2

FIG.2a.

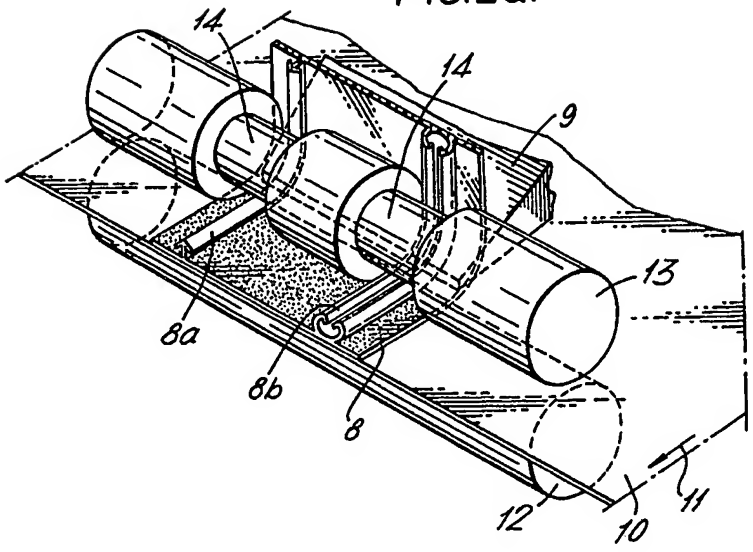


FIG.2b.

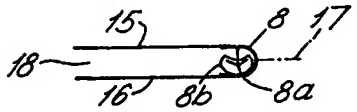
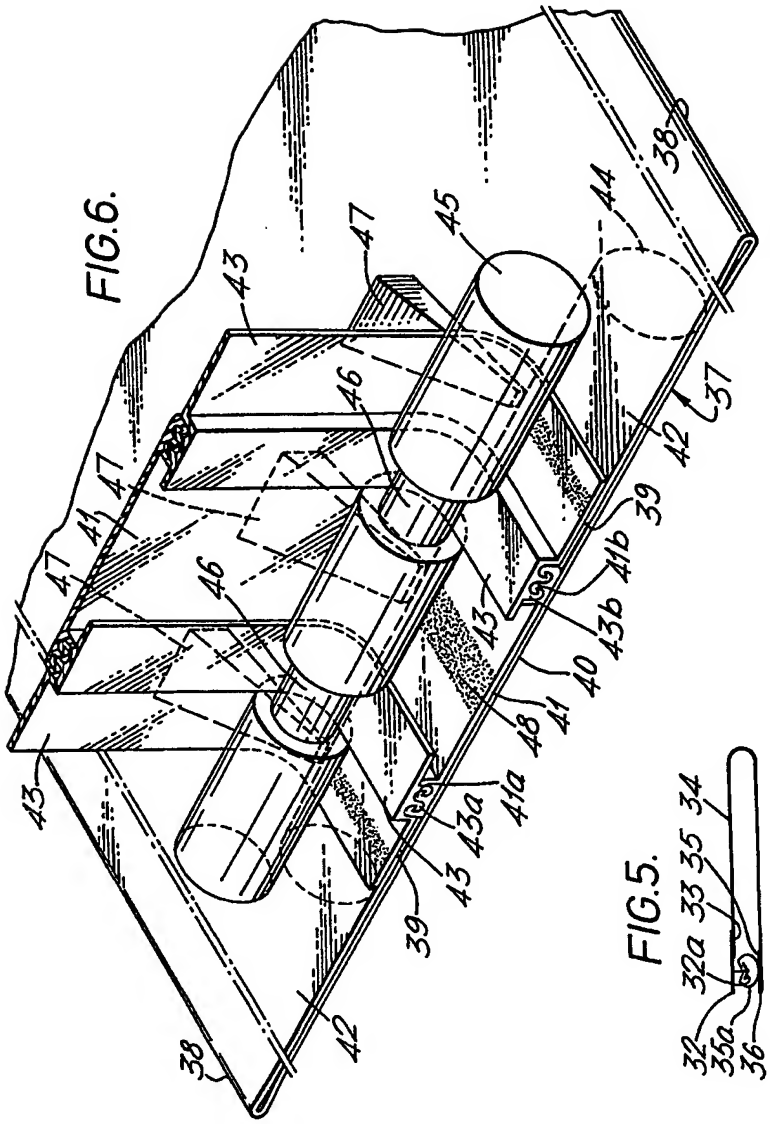


FIG.6.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41b
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43b
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FIG.5.

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32a
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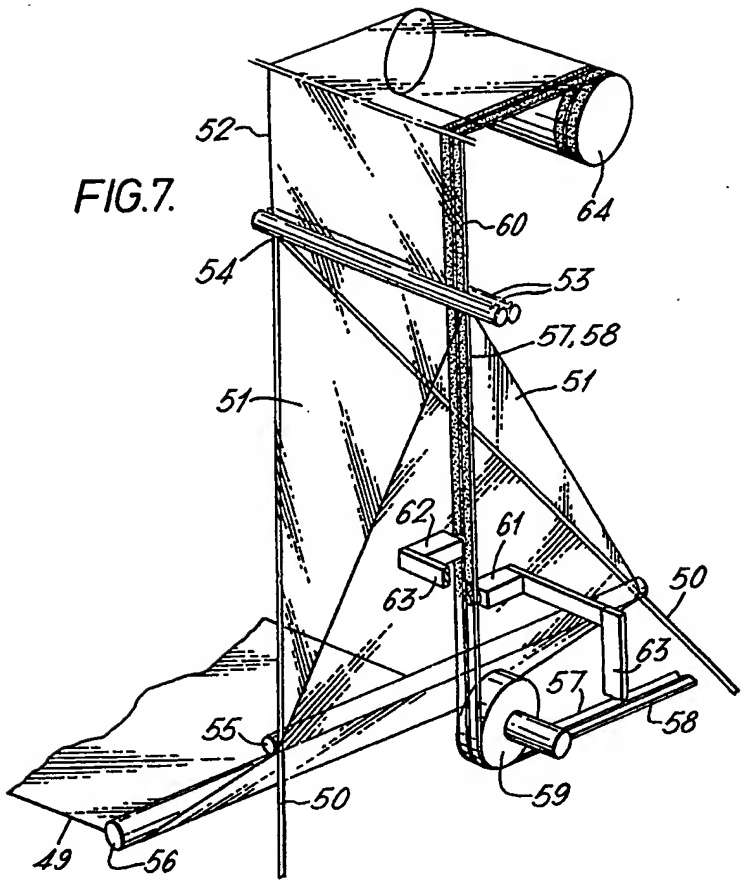
35a
36

FIG.7.



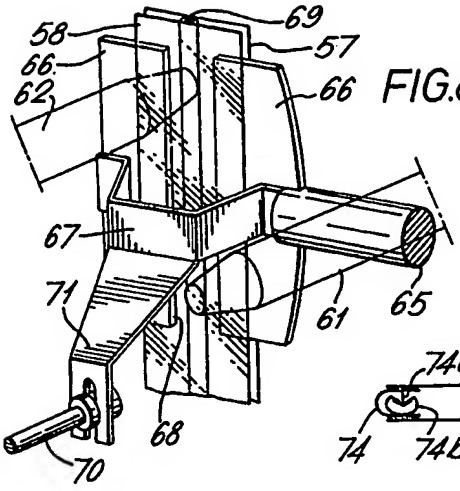


FIG.8.

FIG.9a.

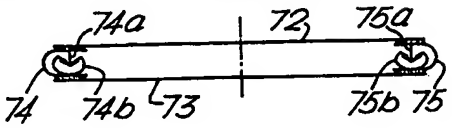


FIG.9b.

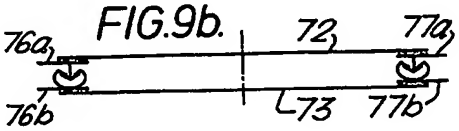


FIG.9c.

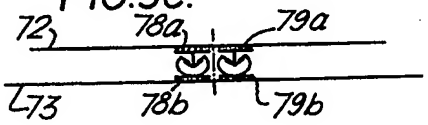


FIG.10.

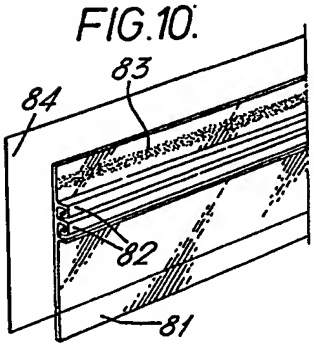


FIG.9d.

FIG.12.

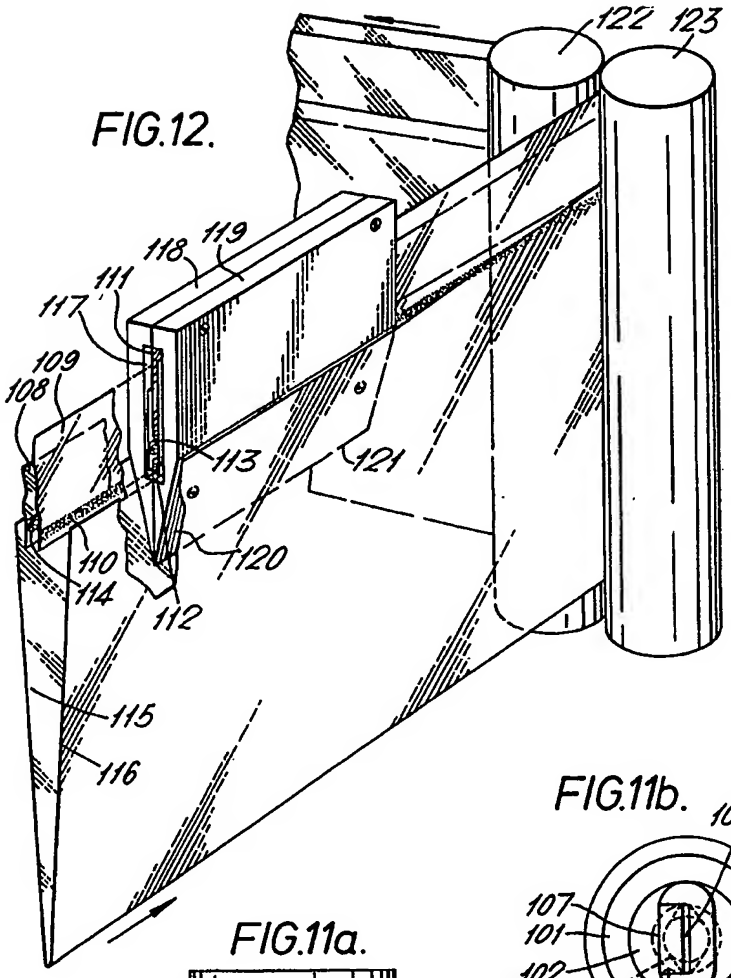


FIG.11b.

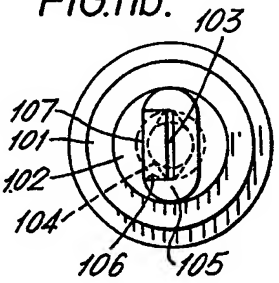


FIG.11a.